National Research Council of Canada, Herzberg Institute of Astrophysics
DAO 1.8-m TELESCOPE OBSERVING TIME REQUEST
Quarter: 2008A

1. Title of the Program *(may be made publicly available for accepted proposals)*:

Plaskett Spectroscopic Supernova Survey (PSSS): Real Time Classification and Spectral Library Acquisition

2. Principal Investigator: **Eric Hsiao**

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3. Co-Investigators:

Melissa Graham	Institute: University of Victoria	E-mail: mgraham@uvic.ca
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Chris Pritchet	Institute: University of Victoria	E-mail: pritchet@uvic.ca

4. Summary of the Program *(may be made publicly available for accepted proposals)*:

The goals of the proposed program are to acquire spectroscopic confirmation and typing of newly discovered supernovae, and to compile a library of evolving supernovae spectra with good temporal coverage.

5. Summary of the Observing Run Requested:

Instrument	Detector	Filters and/or Central Wavelengths
Spectrograph: 21(3/2)1	SITe5 - spec.	5500 Angstroms

# of nights	Robotic/Contract?	Moon (d)	Opt. LST at 0:00 HST	Min. LST at 0:00 HST	Max. LST at 0:00 HST
21	NO	10	Any	Any	Any

6a. Is this a Thesis Project? YES   6b. If yes, indicate supervisor: Dr. Chris Pritchet

7. Special instrument or telescope requirements:

2 arcsecond slit width

8. Scheduling constraints and non-usable dates:

The observing nights, preferably during dark time, should be as evenly spread out throughout the quarter as possible (e.g., seven three-night-runs) to ensure good temporal coverage.

9. Is this program conducted in relation with other observations (optical, radio, space)?

NO

10. Scientific Justification and References *(science background and objectives of the proposed observations: 1 page maximum)*:

Supernovae are essential to understanding the chemical evolution of the universe. Type Ia supernovae are also the most powerful tool currently available for studying the expansion history of the universe and the nature of dark energy. These studies depend critically on the observations of nearby supernovae. The goals of the proposed observations are to spectroscopically confirm and type nearby supernovae and to make well sampled time series spectroscopic observations of these supernovae. This project began in the quarter of 2007C and was granted 14 nights in 2007C and 21 nights in 20007D.

On average, there are about two to three nearby supernovae at bright enough phases to be adequately observed by the Plaskett telescope. Some of these supernovae will require spectroscopic typing. Type Ia supernovae are distinguished from core collapse supernovae by the presence of Si II lines and the absence of hydrogen and helium in their spectra. In 2007C, this survey spectroscopically classified SN 2007gk as a Type Ia supernova using the Plaskett telescope within two days of its discovery (Hsiao et al. 2007).

The properties of a supernova evolve on a timescale of days as the supernova expands after the explosion. Time series spectroscopic observations therefore provide valuable diagnostics from different layers of the supernova as the photosphere recedes toward the core. In 2007C, we obtained 11 supernova spectra from eight clear nights. In the current quarter of 2007D, we have obtained two spectra, including a rare Type Ibc event, from two clear nights of observing. At the time of submission of this proposal, there are still ten nights remaining for the current quarter. The effective integration time for each spectrum is between one and two hours. A subsample of the data is presented in Figure 1.

Preliminary analysis of the spectra of SN 2007gk observed in 2007C showed it to be similar to the spectra of peculiar Type Ia SN 2002bo (Benetti et al. 2004) at pre-maximum phases. Both supernovae have Si II 6355Å lines which are more intense and at higher velocities than normal Type Ia supernovae at the same phase. The emergence of new subclasses of Type Ia supernovae such as SN 2002bo reflects our lack of physical understanding and offers new insights to the nature of these objects. The proposed program will uncover more of these peculiar supernovae and help understand the effects of these objects on the determination of cosmological parameters.

References

Benetti, S., et al. 2004, MNRAS, 348, 261
Hsiao, E. Y., et al. 2007, CBET, 1025, 1

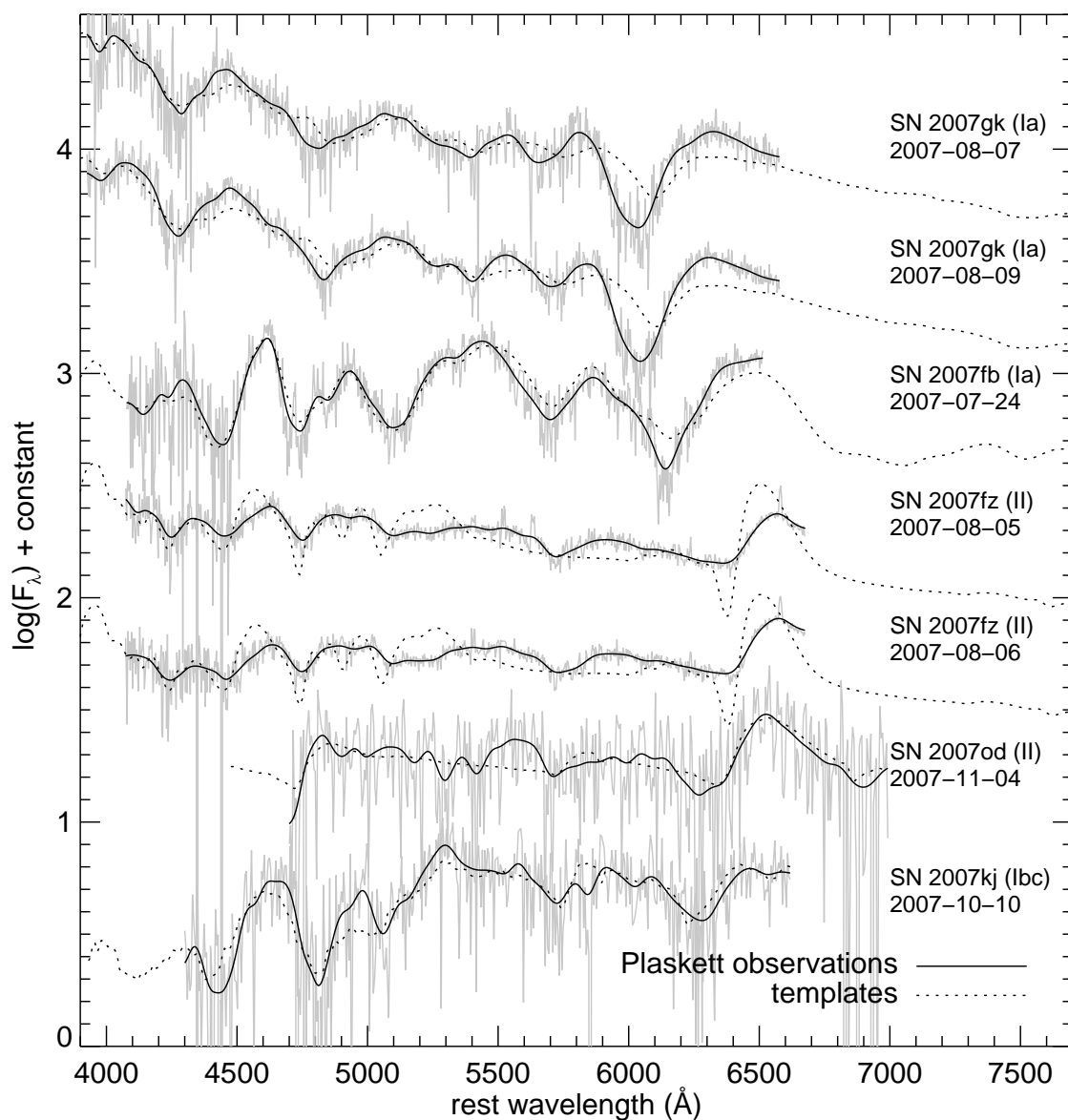11. Figures *(all figures must appear on a single page)*:

Figure 1: A subsample of the supernova spectra observed at the Plaskett telescope in 2007C and 2007D. The spectra have been dereshifted to the rest frame using the redshifts of the host galaxies. The observed spectra (solid curves) are compared with spectral templates (dotted curves) at the best fitting phases. Smoothed observed spectra are plotted to aid the comparison. Observed dates and supernova types are also specified.

14. Targets:

Object/Field	α	δ	Epoch	Mag/Flux	Comment

13. General Target Information:

As supernovae are transient, targets will be selected from available sources of newly discovered supernovae such as IAU circulars and supernova detection surveys on a nightly basis. On average, on a given night, two to three supernovae are selected to be observed by the Plaskett telescope.

14. Publications Resulting from DAO Observations *(only the 12 most recent contained in the database are displayed)*:

Hsiao, E. Y., Graham, M. & Balam, D. 2007, CBET, 1025, 1

Iwamoto, K., Nakamura, T., Nomoto, K., Mazzali, P. A., Danziger, I. J., Garnavich, P., Kirshner, R., Jha, S., Balam, D. & Thorstensen, J. 2000, ApJ, 534, 660

Hurst, G. M., Boles, T., Armstrong, M., Benetti, S., Ghinassi, F., Marchetti, E., Tessicini, G., Vuerli, C., Zacchei, A., Balam, D., Sano, Y. & Yamaoka, H. 1998, IAU Circ., 7033, 1

Yamaoka, H., Kato, T., Filippenko, A. V., van Dyk, S. D., Yamamoto, M., Balam, D., Hornoch, K. & Plsek, M. 1998, IAU Circ., 6859, 1

Disclaimer: *In submitting this application, I acknowledge that I am aware of DAO's policy concerning public access to data after a proprietary period of one year.*

Signature: signed via "POOPSY"